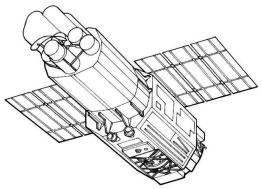
Progress on Microcalorimeters for Con-X

FST Meeting

SAO, May 3-4, 2001

- Introduction
  - R. Kelley — 15 min
- Transition Edge Microcalorimeters
  - K. Irwin/NIST — 20 min
  - C. Stahle/GSFC — 20 min
  - E. Figueroa (GSFC/Stanford) — 15 min
- NTD Ge Microcalorimeters
  - E. Silver/SAO — 20 min

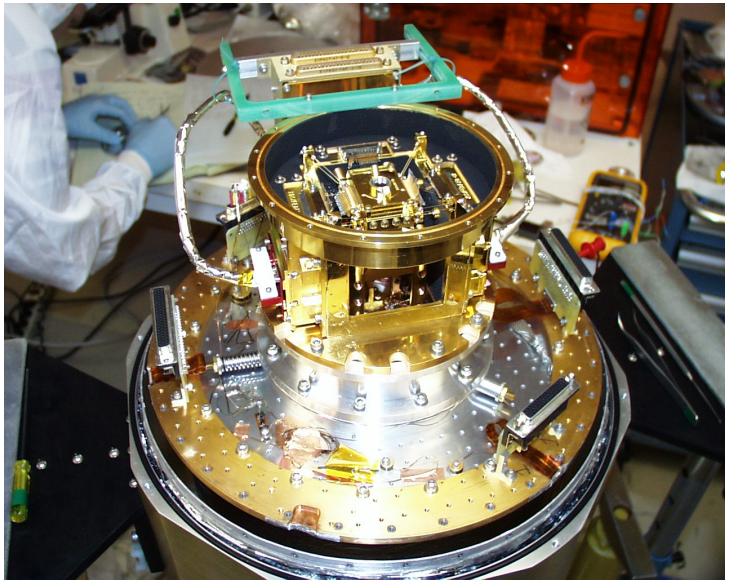


Status of Joule/Astro-E2

- February 2000 — Astro-E lost due to launch vehicle failure
- February 2000 — Submitted *Joule* SMEX proposal to recover XRS science
- September 2000 — *Joule* selected for Phase A study
- October 2000 — Concept Study Report for Astro-E2 MO initiated
- December 2000 — Astro-E2 mission approved in Japan (launch early 2005)
- January 2001 — Submitted Concept Study Report
- February-March 2001 — Evaluated for technical, management and cost soundness, and reevaluated for scientific merit. Received excellent report.

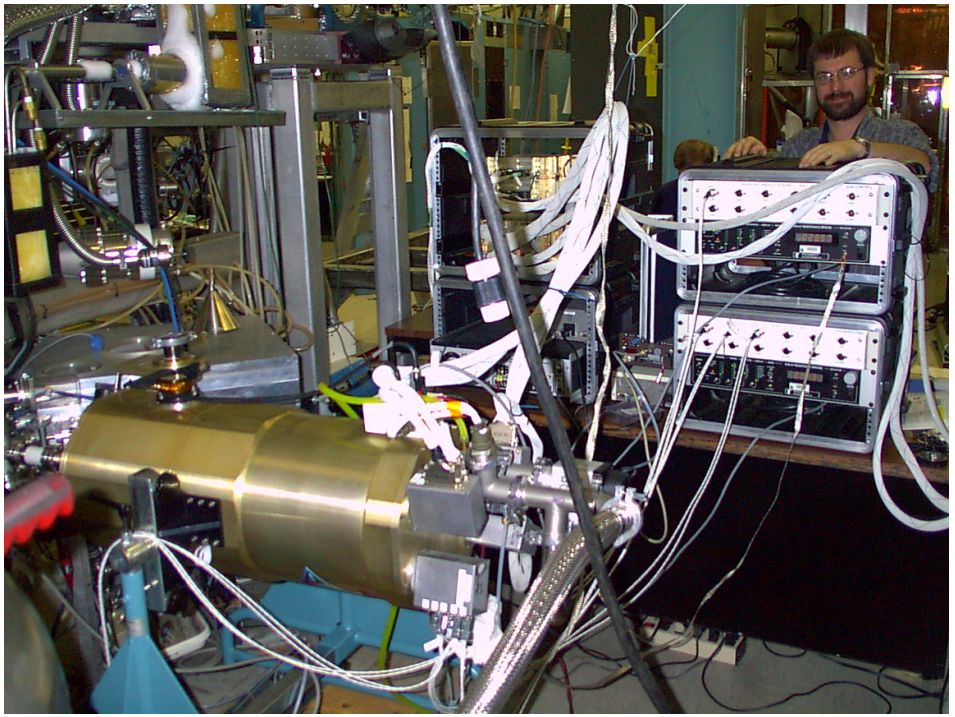
- Final decision pending better definition of FY02 Explorer Budget.

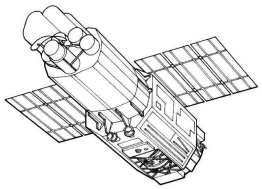
Laboratory Astrophysics with XRS Hardware



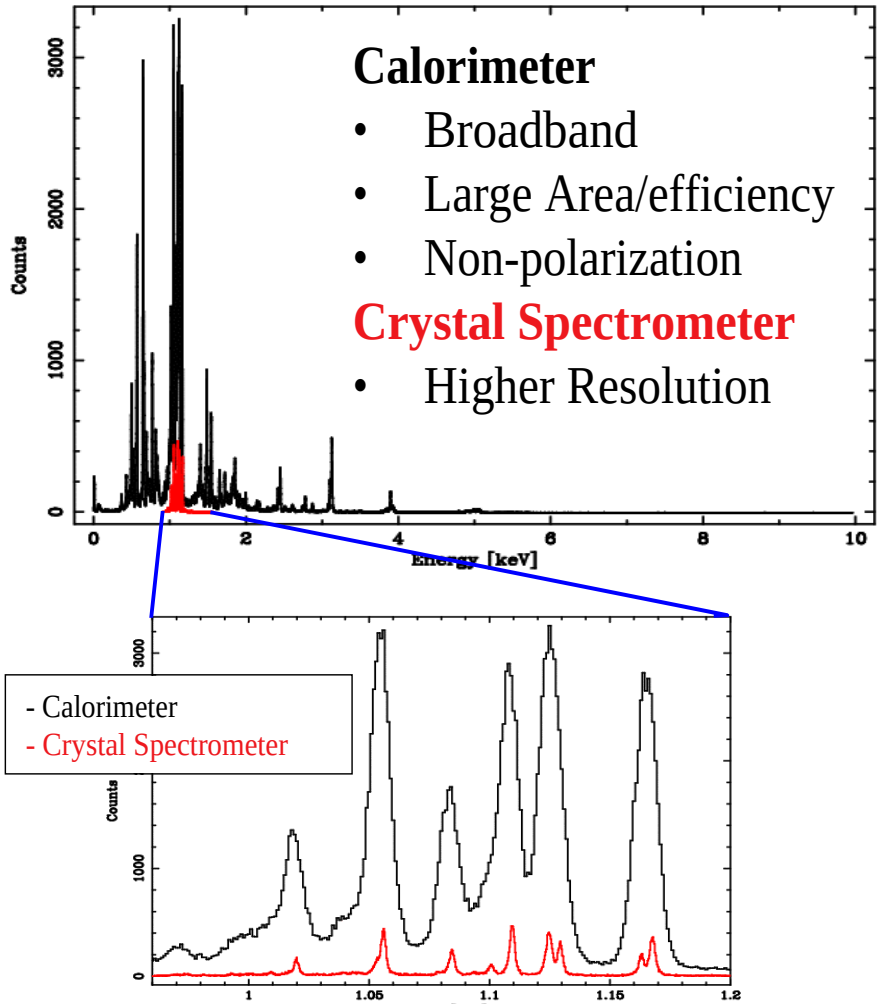
Complete microcalorimeter spectrometer connected to EBIT at the Lawrence Livermore National Laboratory (Summer 2000)

Engineering Model XRS detector system incorporated into compact laboratory ADR dewar. Uses full XRS array system.





Laboratory Astrophysics Using XRS Hardware



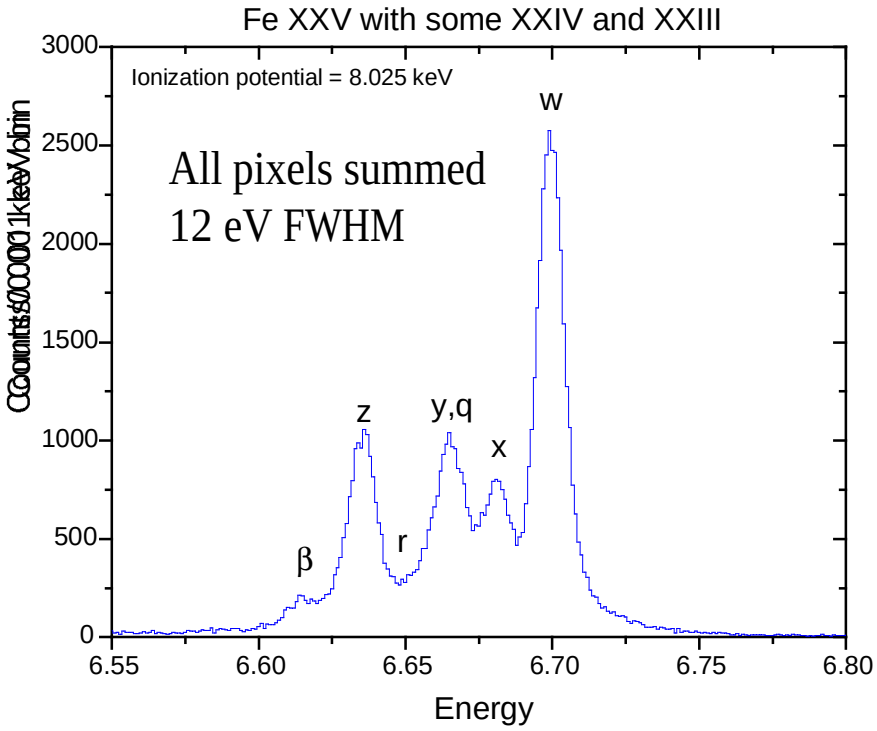
Calorimeter

- Broadband
- Large Area/efficiency
- Non-polarization

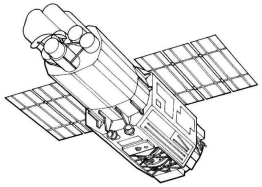
Crystal Spectrometer

- Higher Resolution

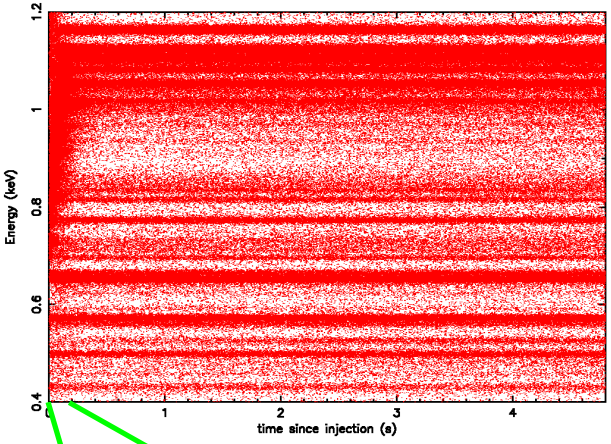
K-shell emission from He-like Iron



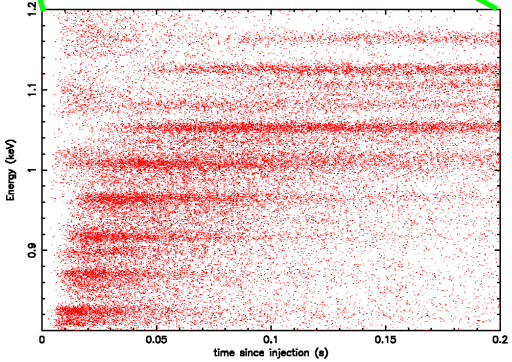
Measurements using Astro-E/XRS engineering model al Lawrence Livermore.



Creating an Ionized Plasma with EBIT

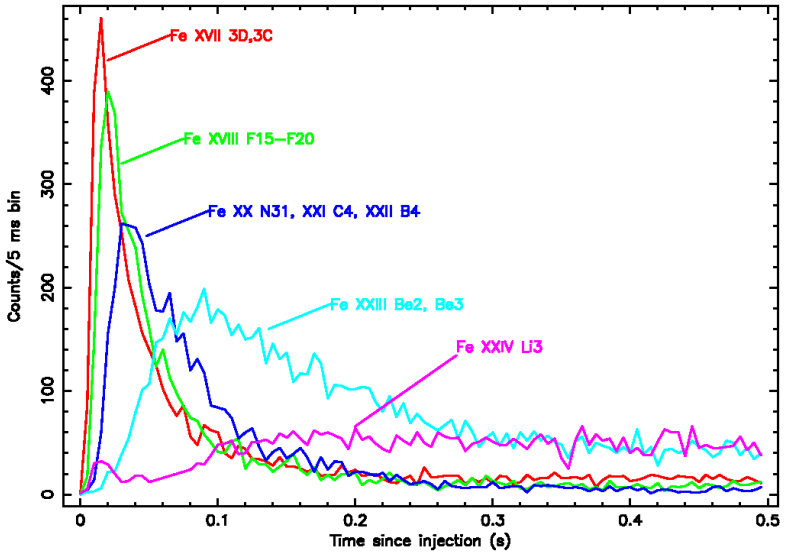


5 sec

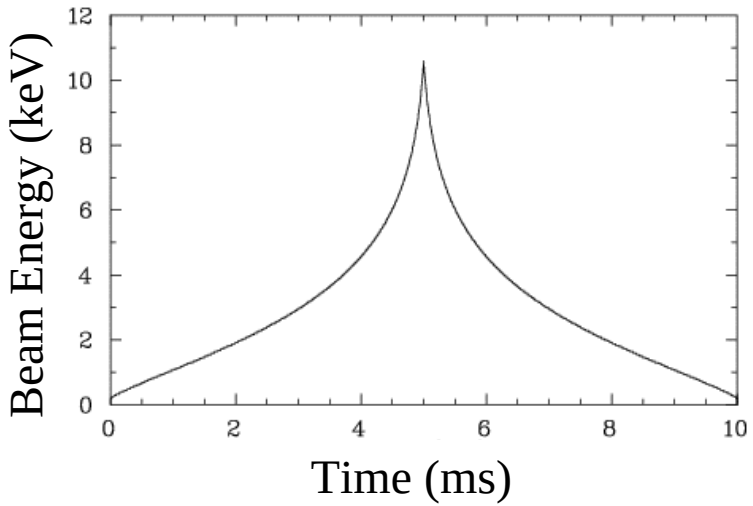


0.2 sec

Every 5 seconds, slightly ionized atoms (+1, +2) are injected into the trap. Once there, these atoms are further ionized by the EBIT electron beam toward an equilibrium state determined by the beam energy.



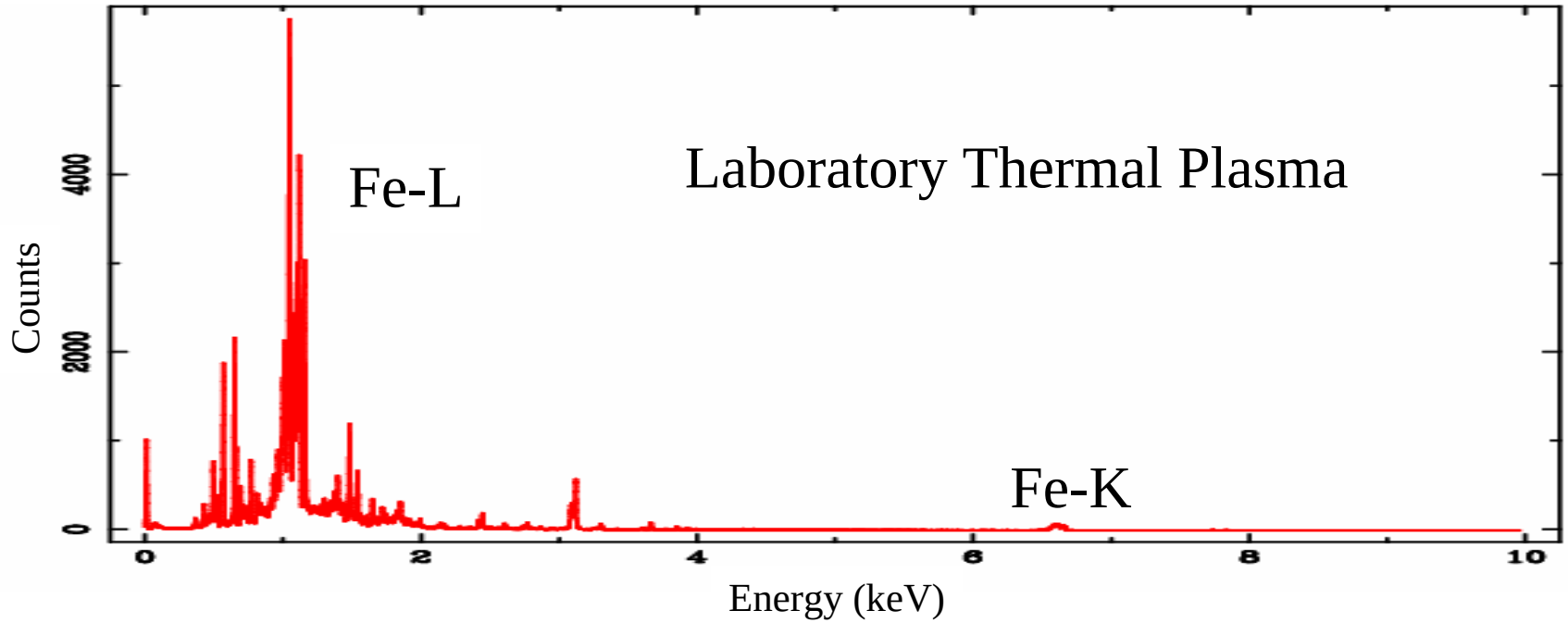
Simulating Thermal Plasmas with EBIT



Vary electron beam energy as a function of time so that it time averages out to a Maxwellian energy distribution with a specified <kT>.

The sweep cycle is faster than ionization and recombination timescales. We repeat the cycle many times over a period of several seconds.

We have completed a first survey from <kT>=0.5 keV to 3 keV



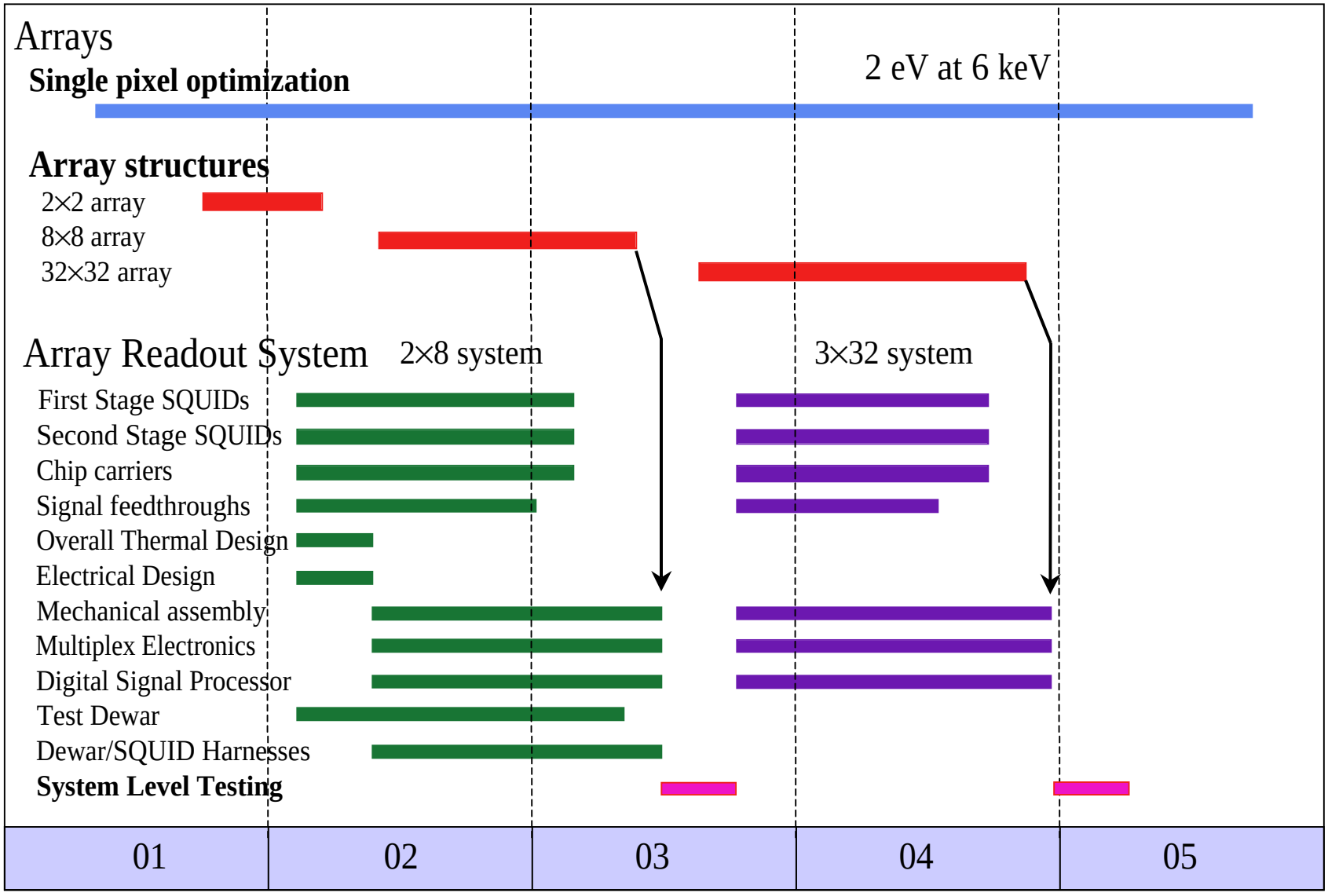
Microcalorimeter Development Strategy for Con-X:

- Continue single pixel/small array development and optimization.
- Start array technologies and associated readout technologies.

  Strive for TRL-6 by the time instrument AO is announced (i.e., demonstrate prototype technology in a “relevant environment”).

  Develop a system that achieves or is very close to achieving performance requirements and is scalable in a straightforward manner (i.e., does not require fundamental breakthroughs to realize a full-size array system.)

TES Microcalorimeter Development for *Constellation-X*



Calendar Years

NTD Germanium Microcalorimeter Development